Coupled-Column Chromatography Used For The Analysis of Coal-Derived Liquids

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Our goal is to utilize the newest LC technology to provide significant improvements in areas of analytical interest. The analysis of complex samples is a challenging problem. Conventional analytical methods for complex samples involve several steps, and hence are long and laborious. Modern LC technology offers speed and efficiency, particularly for the sample clean-up and fractionation steps.

We have developed a fractionation method which makes use of two different types of columns: a low-resolution partition column and a size-exclusion column. The low resolution column has the same separation mechanism as the ultimate analytical column. This fractionation stage limits the retention range of compounds to be chromatographed in the analytical step. The selected fraction from this low resolution column is transferred to a size-exclusion column which separates compounds on the basis of their molecular size. This second stage of fractionation greatly reduces the number of compounds within this retention range.

We have utilized the coupled-column chromatography (CCC) system to obtain fast and qualitative characterization of a sample prior to the analytical step.

We have demonstrated the compatibility of the CCC system with analytical methods, specifically, the determination of PAHs and phenols by reversed-phase LC.

Use of the CCC fractionation system with samples such as coal liquids resulted in very reproducible performance of analytical columns, performance which is required for identification and quantitation of individual compounds.

Additional verification of individual PAHs was provided by fluorescence detection at two selective excitation and emission wavelength sets.

In the case where the determination of many compounds in very complex samples is needed, additional resolution is required.